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Implementation of Remote Sensing Models to Monitor, Assess and Map Range Condition and Carbon Flux

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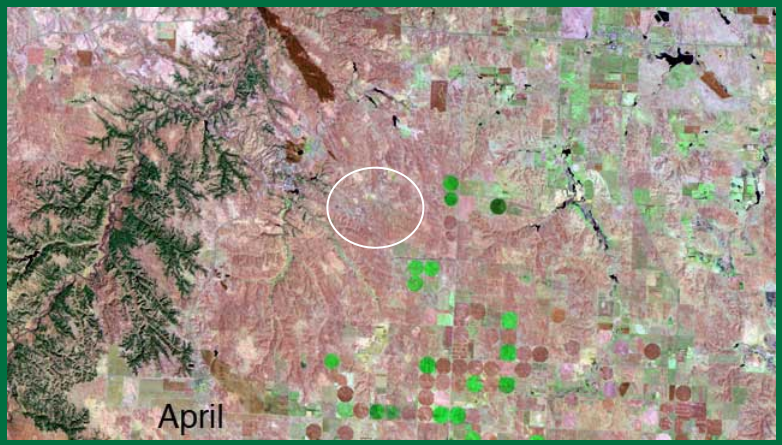
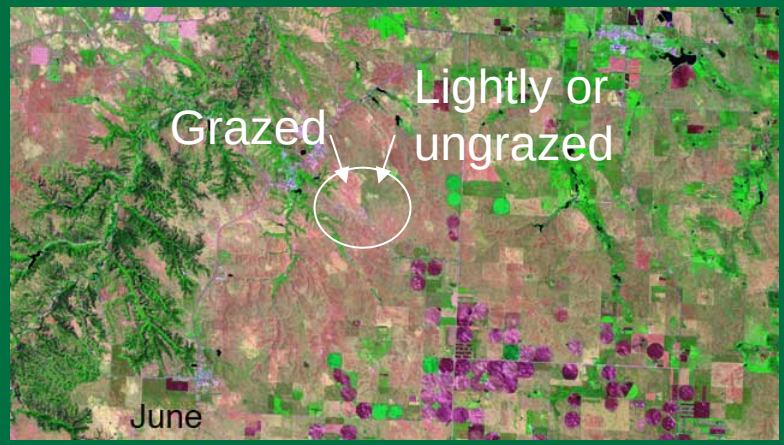
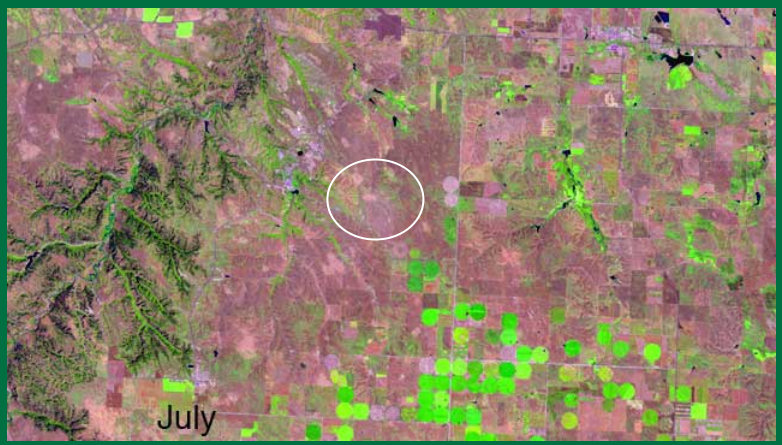
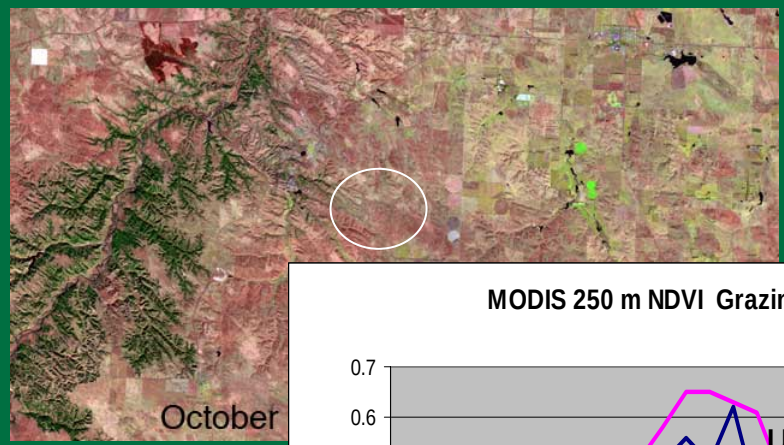
Land Management – Grazing Impacts

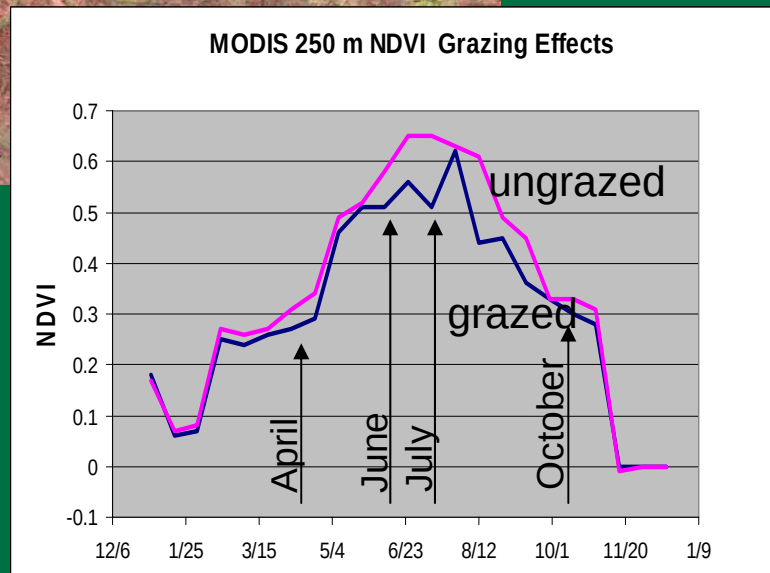




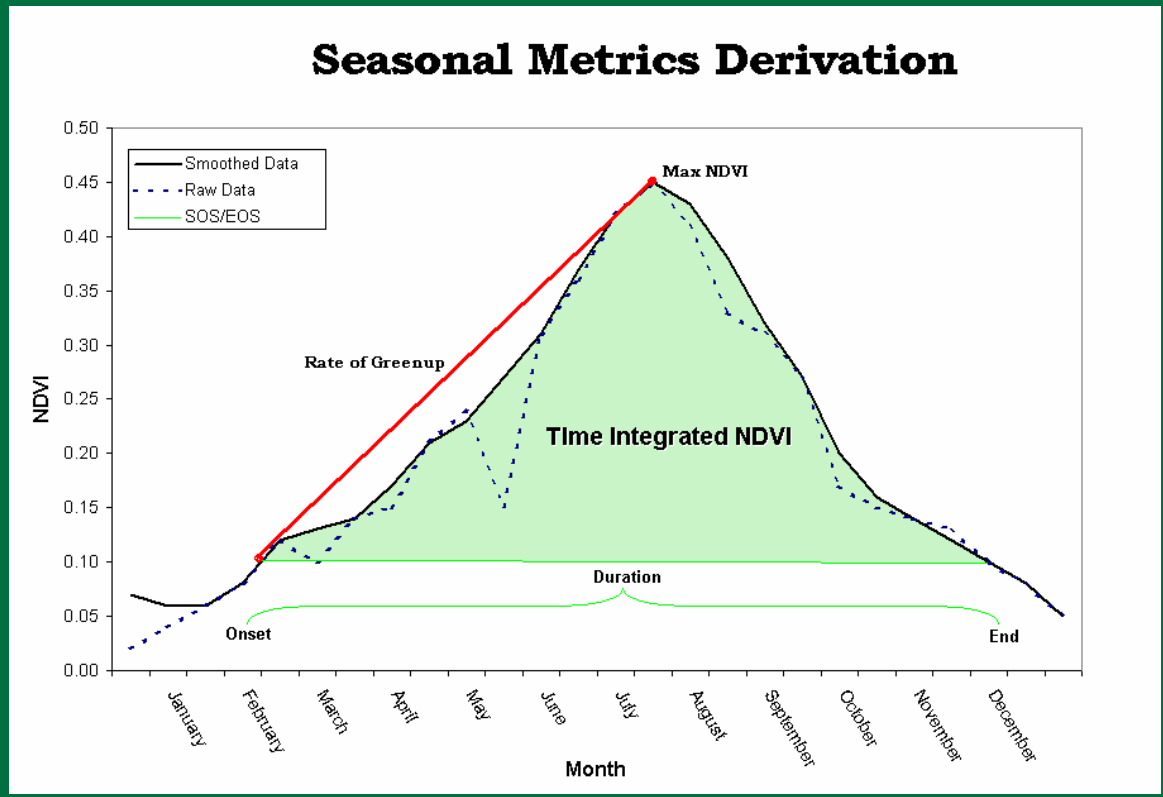




Landsat TM identification of likely rotational grazing system is reflected in lower productivity by MODIS NDVI for grazed pasture



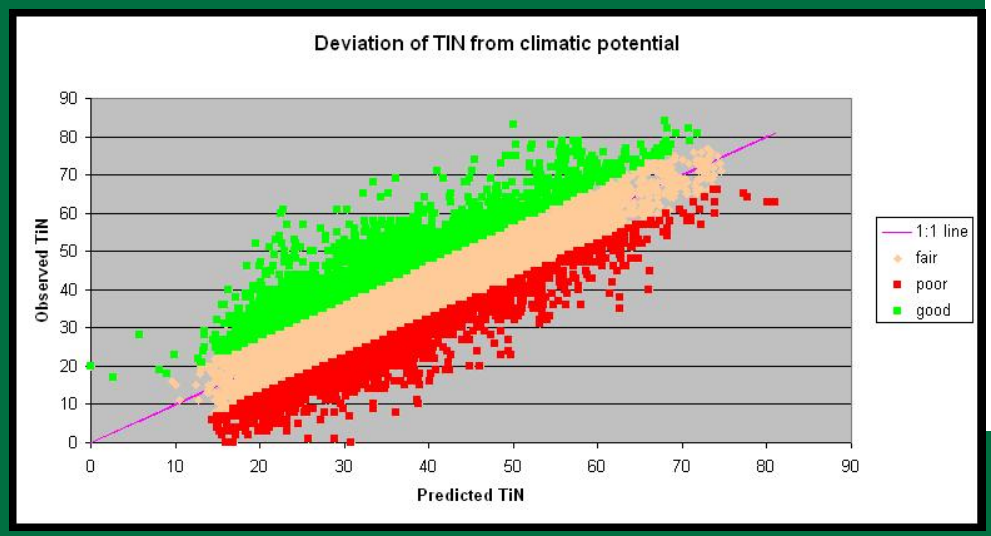
Time Integrated NDVI (TIN), a Surrogate for Ecosystem Performance

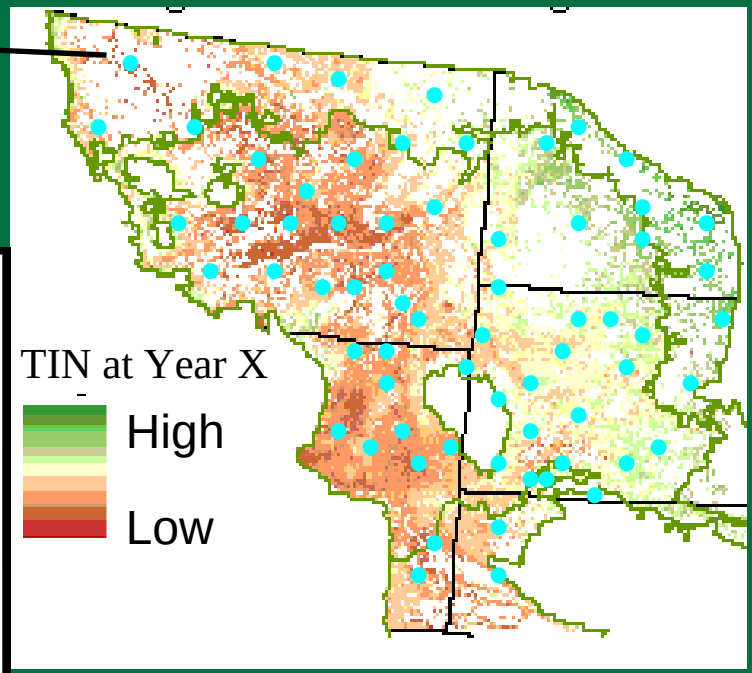


Estimation of TIN from Meteorological Data and Site Potential

- The Model is developed to estimate TIN based on numerous pixel's behavior over several years.
- Compensates (or de-trends) for climatic variation (droughts, wet years)
- Reveals non-climate related anomalies

Based on 5,000 random range sites sampled across years





TIN = f(precipitation,
temperature,
site potential)

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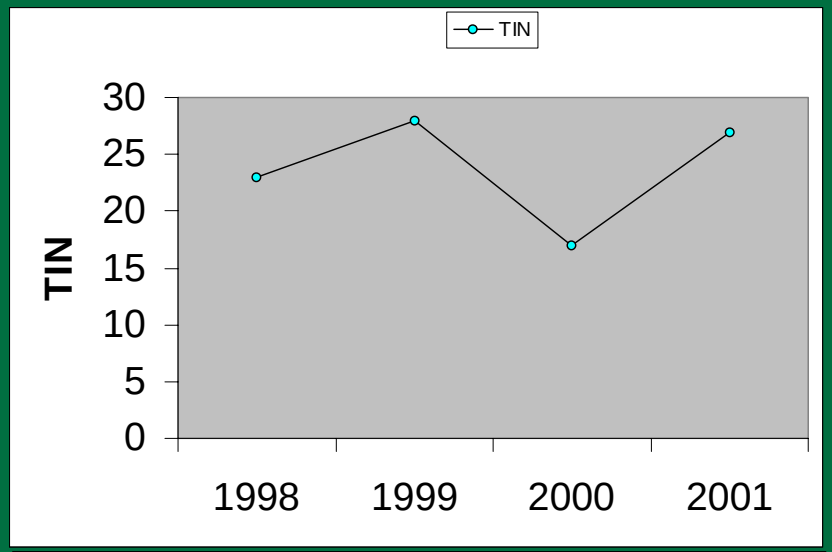
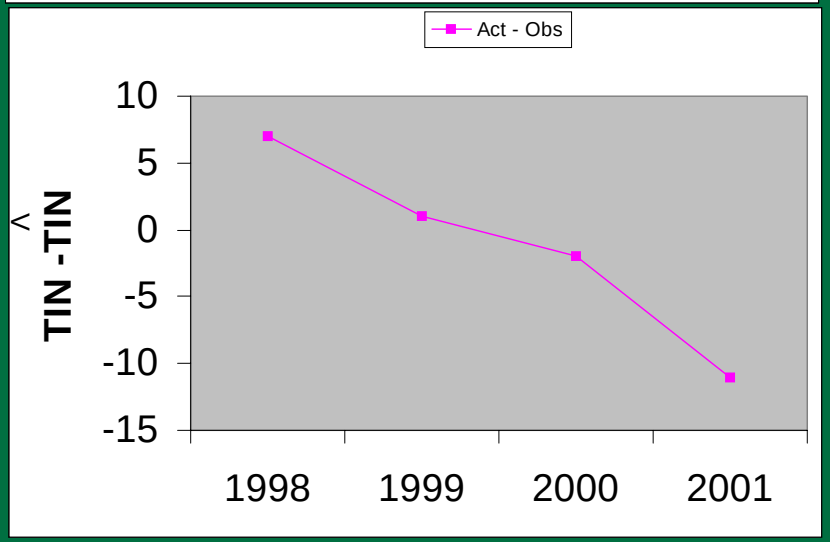
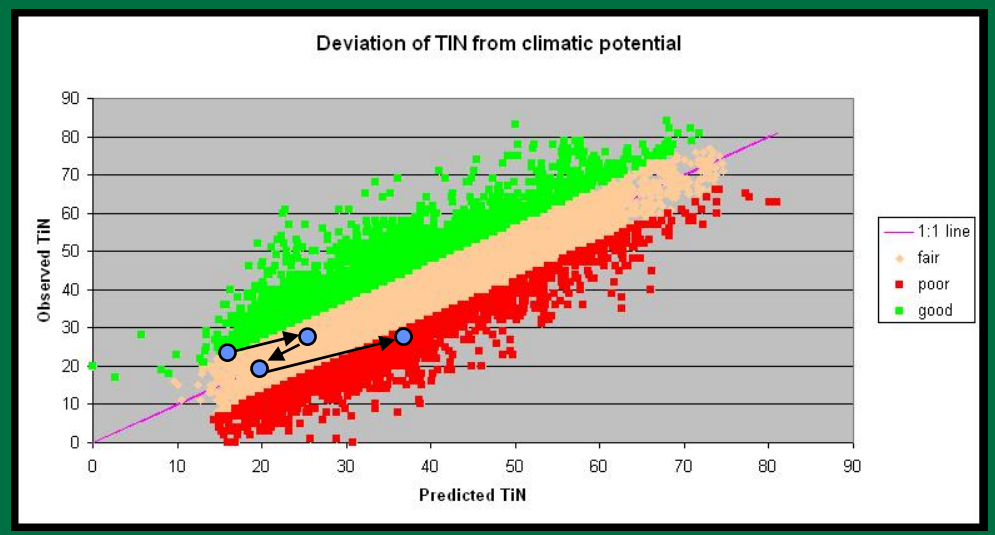
This Compliments Classical NDVI Trend Analysis



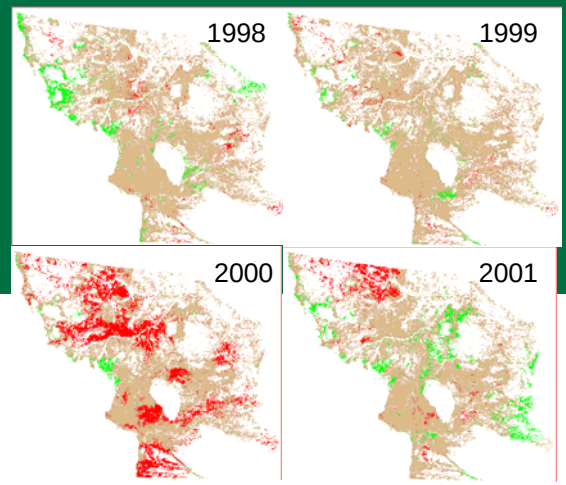


and reveals management and other effects

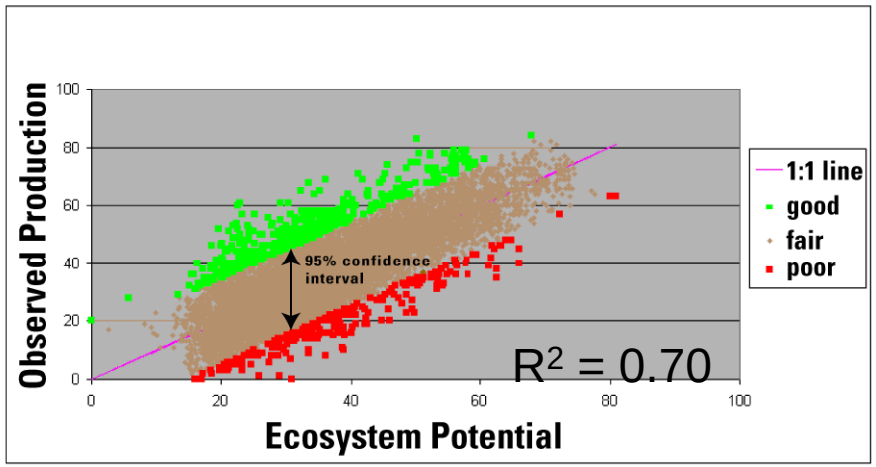


Expected performance adjusted for climate

Previous work with SPOT VEGETATION 1998-2001

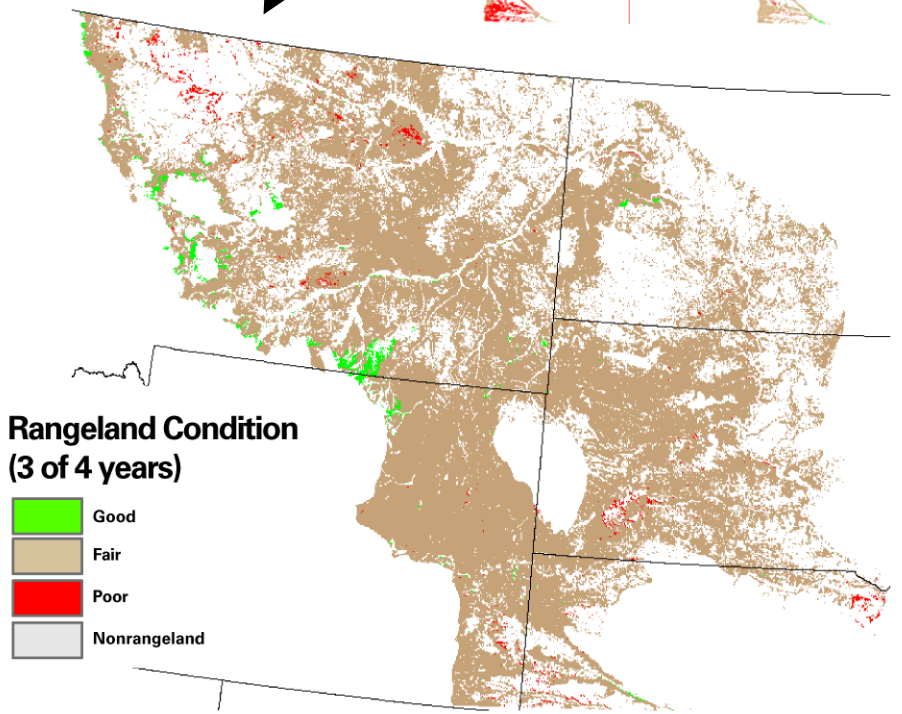


Rangeland Ecosystem Services
(Ecosystem Potential - Observed Production)



Good - The rangeland is more productive than expected: Good management practices

Poor - The rangeland is less productive than expected: Degraded or overgrazed rangeland



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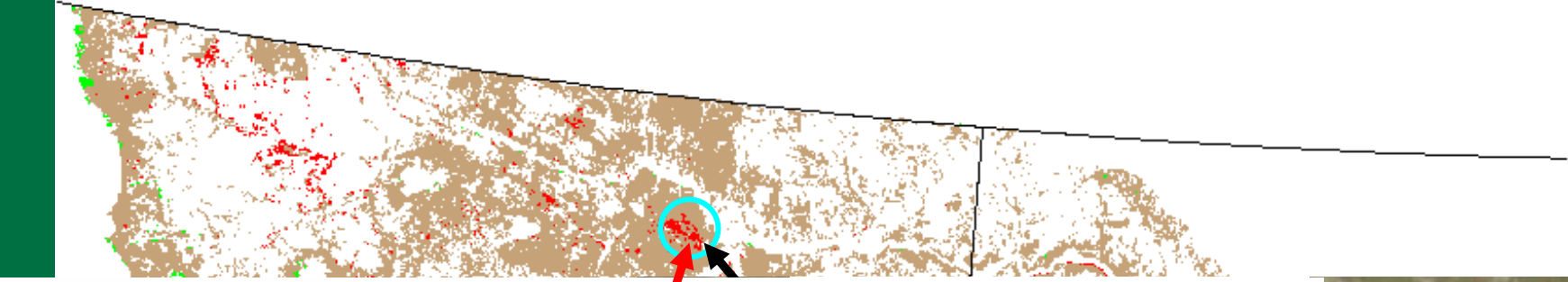
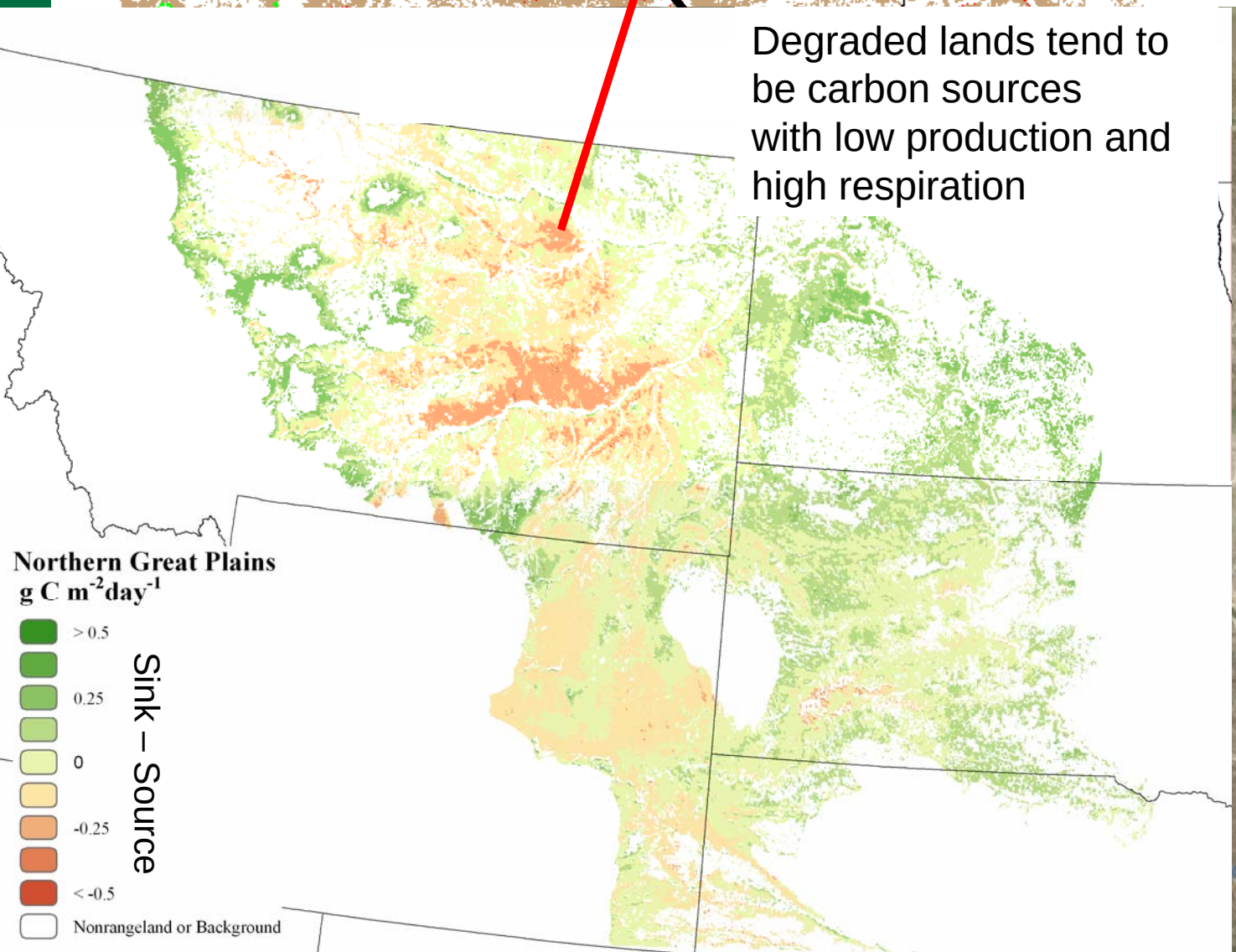
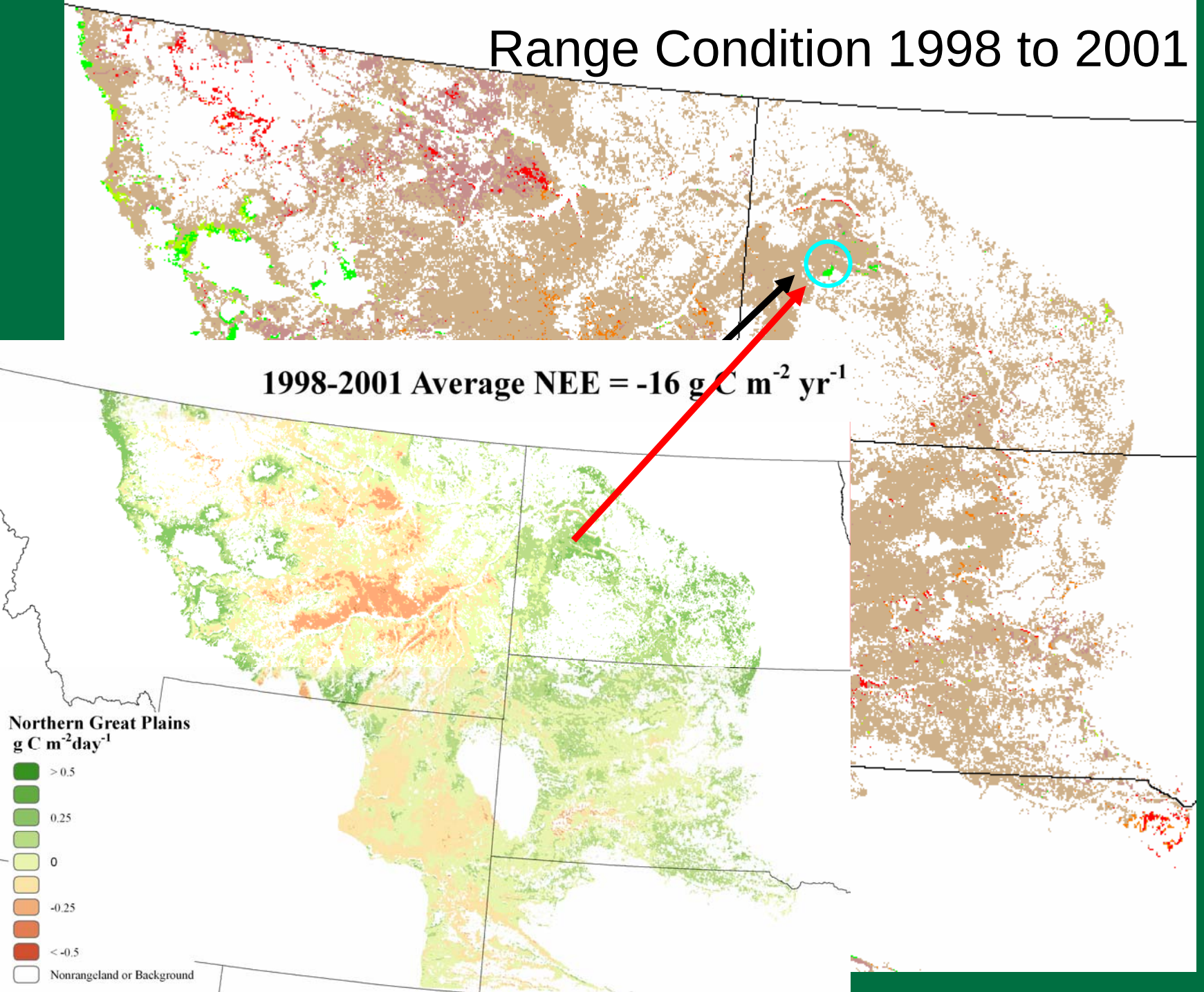


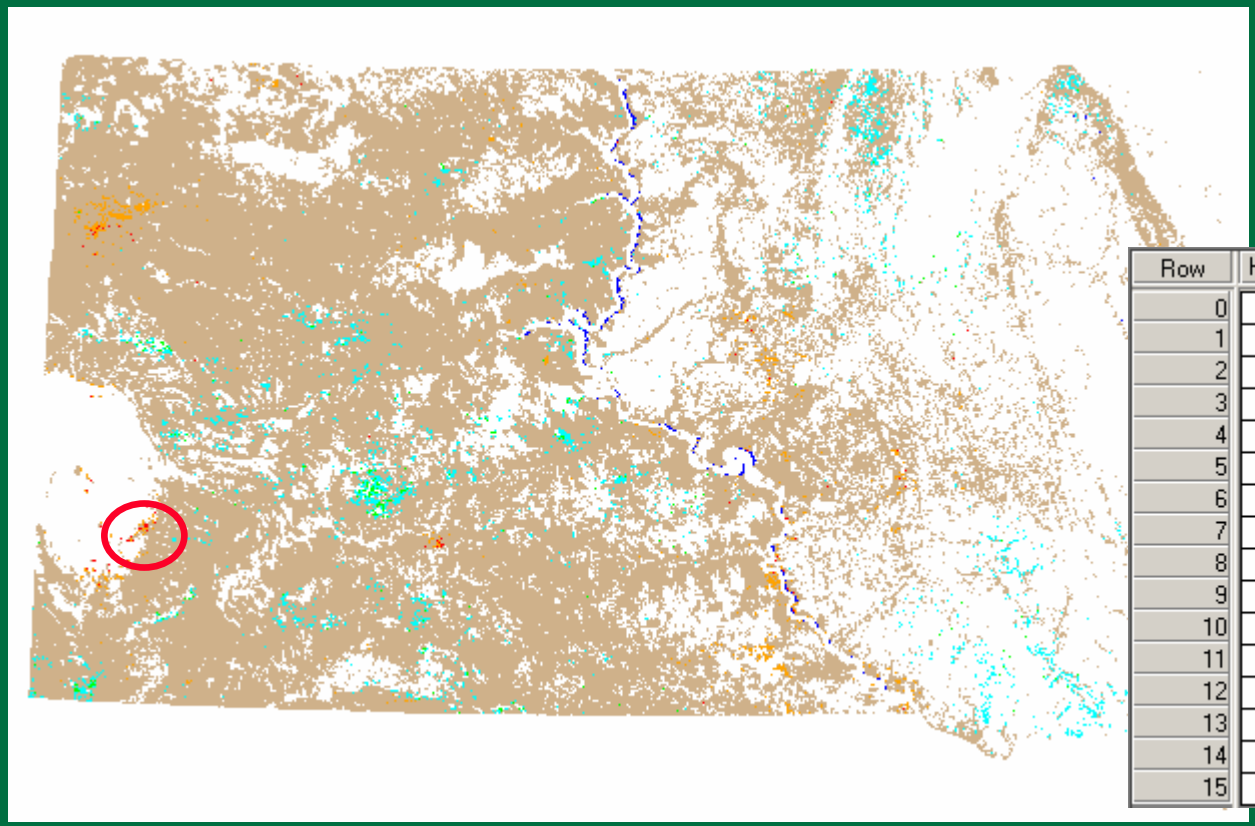
Degraded lands tend to be carbon sources with low production and high respiration



Range Condition 1998 to 2001



A Similar Analysis of South Dakota Rangelands with AVHRR TIN (1998-2004) identified the Galena fire (1988)



Row	Histogram	Class Names	Color
0	94280	fair	
1	84	poor>=4 yrs	
2	890	poor>=3 yrs,good <=1yr	
3	269	good>=4 yrs	
4	2691	good>=3yrs, poor<=1yr	
5	0		
6	0		
7	0		
8	0		
9	0		
10	0		
11	0		
12	0		
13	0		
14	230	AVHRR water mask	
15	179686	< 60% rangeland	

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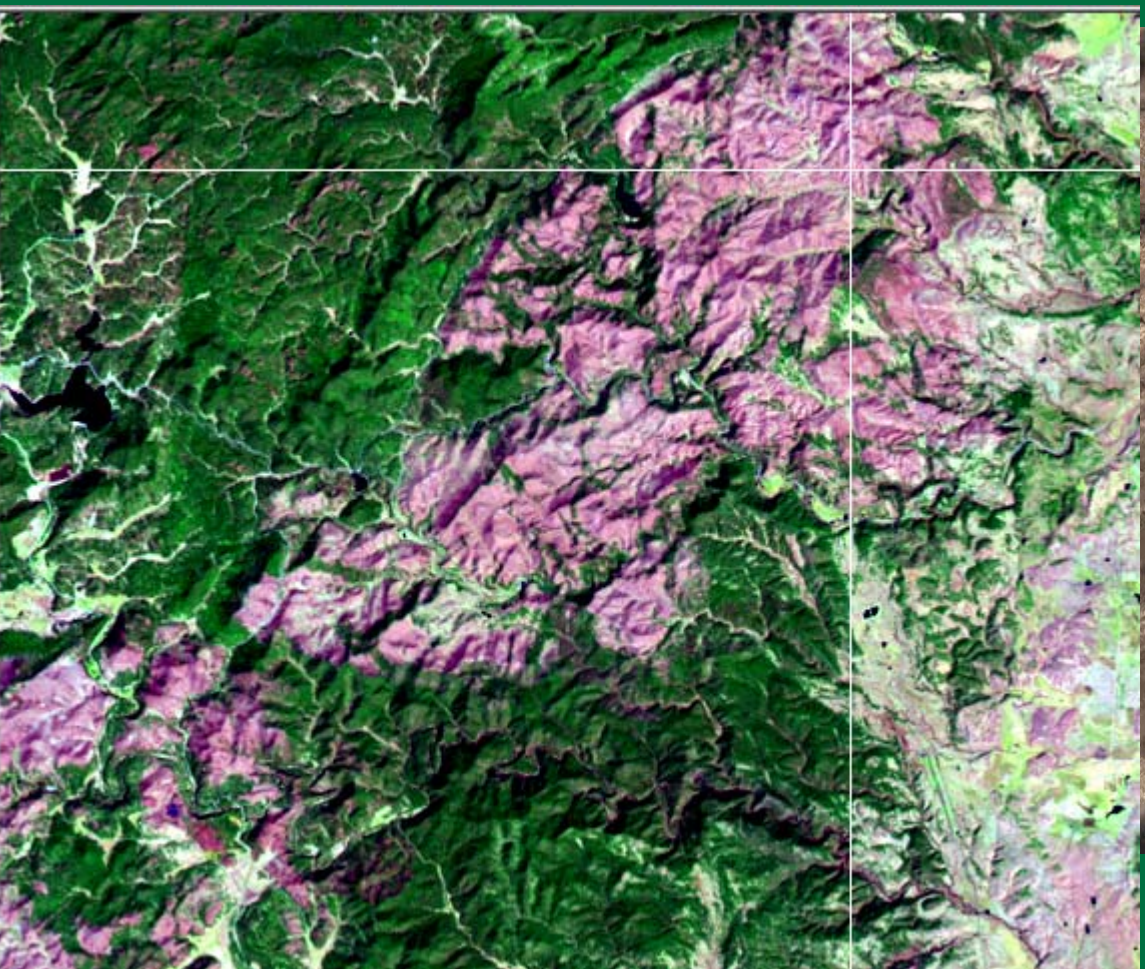
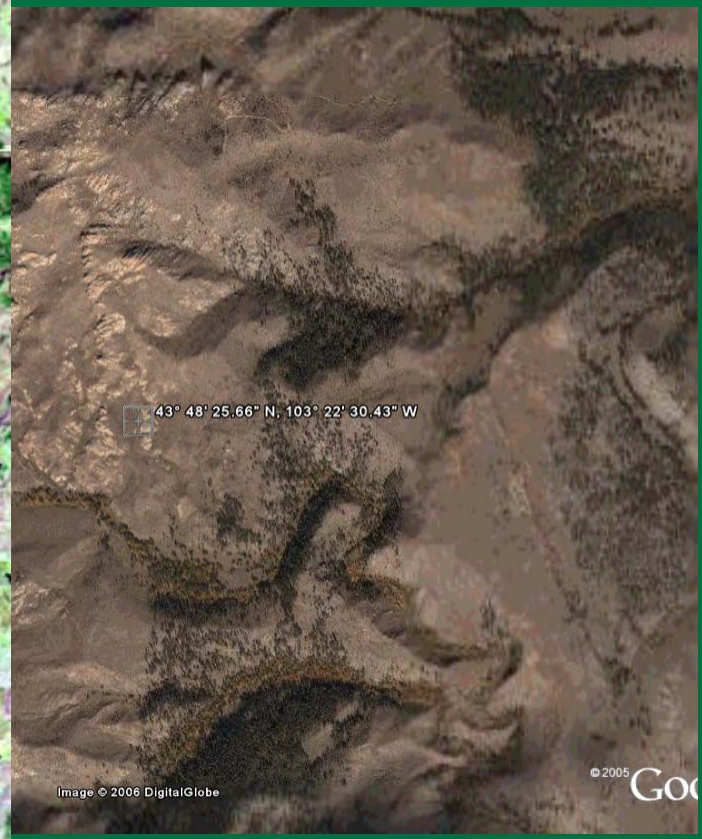
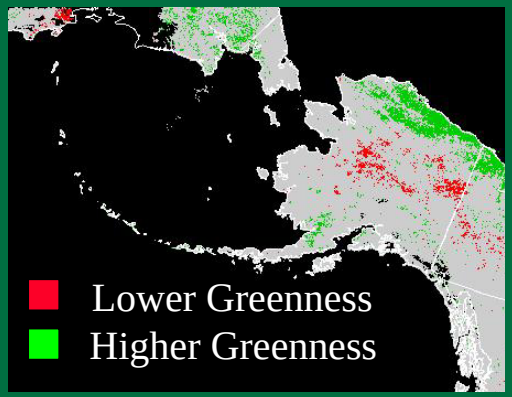
“severely burned areas underwent surficial erosion nearly twice that of the unburned areas.” Driscoll et al. 2004

2000 Landsat





Future Direction

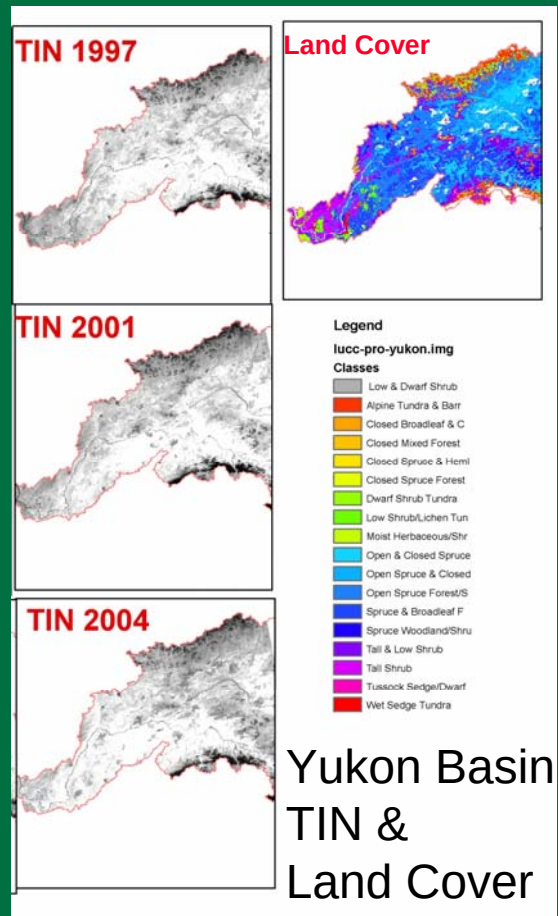


(From Reed et al. 2005)

This will identify regions in the Yukon Basin where boreal forest are not performing as expected. This will allow more focus on these anomalous areas, which are significant to carbon modeling and possible ecosystem changes.

Dramatic Changes in Arctic Ecosystems Related to Climate Change: Alaskan boreal forests

- Decreasing NDVI (Reed et al. 2005, Goetz 2005)
- Increasing disease/insects in boreal forests
- Increasing fires
- Increasing moisture/temperature stresses
- Degrading permafrost



Yukon Basin TIN & Land Cover